Student Handbook

February 26, 2014 - Bullion Plaza Museum, Miami

2014 Gila County

Science Fair

Explore The Possibilities

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2014 Gila County Regional Science Fair Committee

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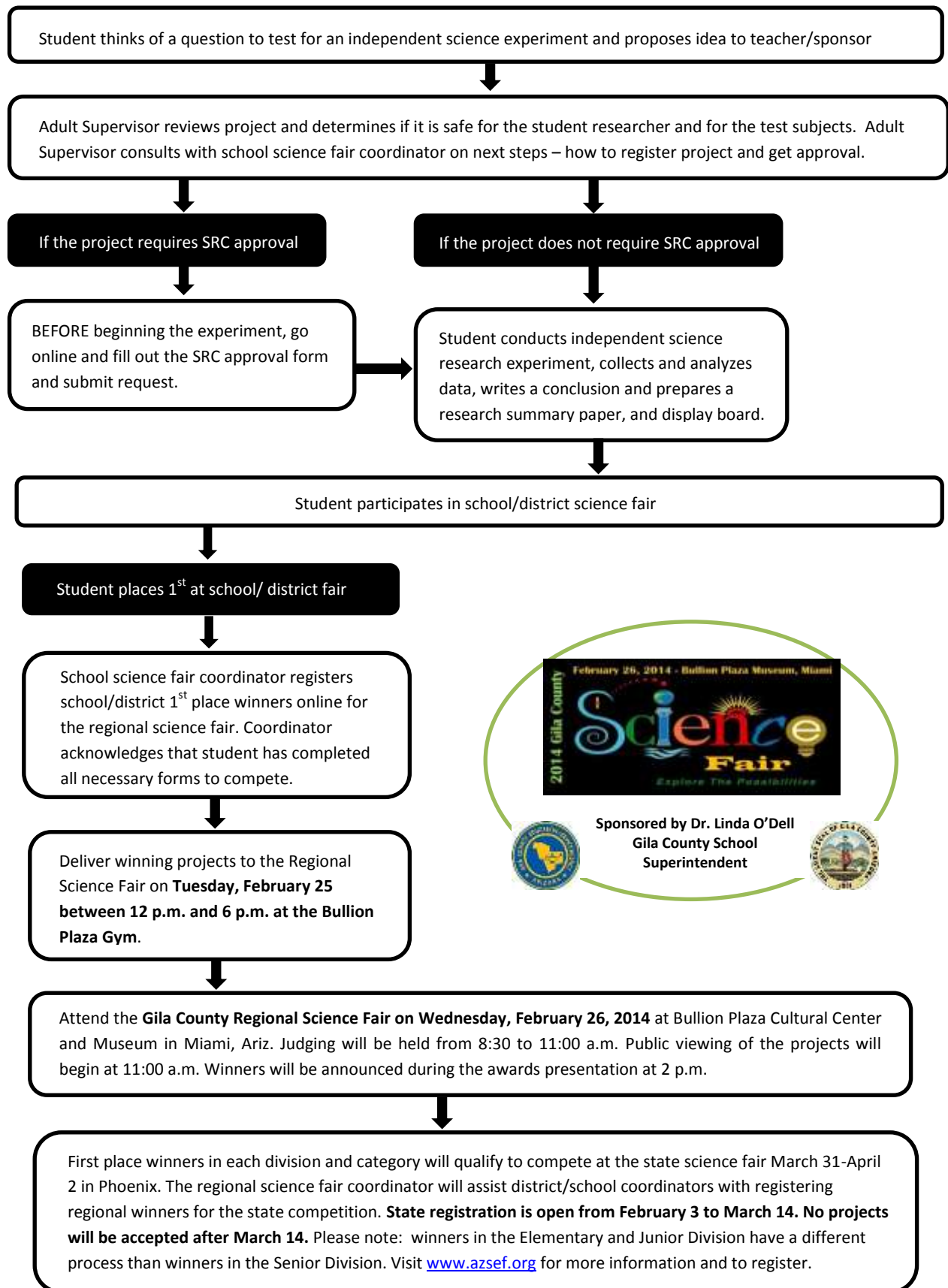
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Resources

- Gila County Schools website   www.gilacountyschools.org
- Arizona Science & Engineering Fair website   www.azsef.org
- Society for Science & the Public   www.societyforscience.org
- Virtual Science Investigation   http://school.discoveryeducation.com/sciencefaircentral
- Science Buddies   www.sciencebuddies.org (offers an interest inventory questionnaire to help students choose a science fair project)
- Southern Arizona Science and Engineering Fair website   www.sarsef.org
- Arizona Science Center   www.azscience.org
- Video Series: How to Do a Science Fair Project   www.jpl.nasa.gov/education/sciencefair

Student thinks of a question to test for an independent science experiment and proposes idea to teacher/sponsor

Adult Supervisor reviews project and determines if it is safe for the student researcher and for the test subjects. Adult Supervisor consults with school science fair coordinator on next steps – how to register project and get approval.

If the project requires SRC approval

If the project does not require SRC approval

BEFORE beginning the experiment, go online and fill out the SRC approval form and submit request.

Student conducts independent science research experiment, collects and analyzes data, writes a conclusion and prepares a research summary paper, and display board.

Student participates in school/district science fair

Student places 1st at school/ district fair

School science fair coordinator registers school/district 1st place winners online for the regional science fair. Coordinator acknowledges that student has completed all necessary forms to compete.

Deliver winning projects to the Regional Science Fair on **Tuesday, February 25 between 12 p.m. and 6 p.m. at the Bullion Plaza Gym**.

**Sponsored by Dr. Linda O'Dell
Gila County School
Superintendent**

Attend the **Gila County Regional Science Fair on Wednesday, February 26, 2014** at Bullion Plaza Cultural Center and Museum in Miami, Ariz. Judging will be held from 8:30 to 11:00 a.m. Public viewing of the projects will begin at 11:00 a.m. Winners will be announced during the awards presentation at 2 p.m.

First place winners in each division and category will qualify to compete at the state science fair March 31-April 2 in Phoenix. The regional science fair coordinator will assist district/school coordinators with registering regional winners for the state competition. **State registration is open from February 3 to March 14. No projects will be accepted after March 14.** Please note: winners in the Elementary and Junior Division have a different process than winners in the Senior Division. Visit www.azsef.org for more information and to register.

SCIENCE PROJECT TIMELINE

Here is a timeline to help you complete the steps of your project. Be sure to read and follow the instructions in this handbook as you work through each step of your project.

Student Name: _____

Project Title: _____

Date Due	Completed	Steps
_____	_____	Begin a log book. Write down possible topics and ideas for your project.
_____	_____	Select a topic and choose your study design.
_____	_____	Gather background information about the history, significance, facts, and methods of study for your topic.
_____	_____	Prepare a bibliography of your sources.
_____	_____	Decide on the problem and the hypothesis.
_____	_____	Define your independent variable (IV), dependent variable (DV), and constant variable (CV).
_____	_____	List the materials and write the procedure.
_____	_____	Collect the materials that you will need (including display board) and do a trial run of your procedure to be sure that it is going to work as planned.
_____	_____	Prepare a data table for recording results.
_____	_____	Run at least THREE trials of your procedure and collect data using metric measurements.
_____	_____	Take photographs or draw pictures being sure NOT to include peoples' faces.
_____	_____	Construct a graph that shows that the averages of your results and write a summary of your findings.
_____	_____	Write the conclusion and discuss the scientific worth of your project.
_____	_____	Write the project report (secondary only).
_____	_____	Prepare the items for the display and arrange them attractively on the board.

The Scientific Method vs. The Engineering Design Process

The scientific method is a way to ask and answer scientific questions by making observations and doing experiments. The steps of the scientific method are to:

- Ask a Question
- Do Background Research
- Construct a Hypothesis
- Test Your Hypothesis by Doing an Experiment
- Analyze Your Data and Draw a Conclusion
- Communicate Your Results

It is important for your experiment to be a fair test. A "fair test" occurs when you change only one factor (variable) and keep all other conditions the same.

Engineering Design Process

While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences.

- If your project involves creating or inventing something new, your project might better fit the steps of the Engineering Design Process.
- If you are not sure if your project is a scientific or engineering project, you should read "Comparing the Engineering Design Process and the Scientific Method".

The engineering design process is the set of steps that a designer takes to go from first, identifying a problem or need to, at the end, creating and developing a solution that solves the problem or meets the need. The steps of the engineering design process are to:

- Define the Problem
- Do Background Research
- Specify Requirements
- Brainstorm Solutions
- Choose the Best Solution
- Do Development Work
- Build a Prototype
- Test and Redesign

During the engineering design process, designers frequently jump back and forth between steps. Going back to earlier steps is common. This way of working is called **iteration**, and it is likely that your process will do the same!

While engineers create new things, such as products, websites, environments, and experiences, scientists study how nature works.

Keep in mind that although the steps below are listed in sequential order, you will likely return to previous steps multiple times throughout a project. It is often necessary to revisit stages or steps in order to improve that aspect of a project.

You can see the steps of each process in this chart:

Steps of The Scientific Method	Steps of the Engineering Design Process
State your question	Define the problem
Do background research	Do background research
Formulate your hypothesis, identify variables	Specify requirements
Design experiment, establish procedure	Create alternative solutions, choose the best one and develop it
Test your hypothesis by doing an experiment	Build a prototype
Analyze your results and draw conclusions	Test and redesign as necessary
Communicate results	Communicate results

Which process should I follow for my project?

In real life, the distinction between science and engineering is not always clear. Scientists often do some engineering work, and engineers frequently apply scientific principles, including the scientific method. Much of what we often call "computer science" is actually engineering—programmers creating new products. Your project may fall in the gray area between science and engineering, and that's OK. Many projects, even if related to engineering, can and should use the scientific method.

However, if the objective of your project is to invent a new product, computer program, experience, or environment, then it makes sense to follow the engineering design process.

Important Note: Most, but not all, science fairs accept engineering projects completed using the engineering design process. Some even encourage it. However, if in doubt, you should check with your fair before you follow the engineering design process instead of the scientific method.

Science fair projects are judged based on age division and subject category. First place winners in each division and category from participating schools/districts are eligible to compete in the Regional Fair.

Divisions

The Gila County Regional Fair features three divisions of competition:

- Elementary Division – Grades 5-6
- Junior Division – Grades 7-8
- Senior Division – Grades 9-12

All three divisions are eligible for state competition.

Categories

Elementary & Junior Division Categories:

- Animal Sciences
- Behavioral & Social Sciences
- Cellular & Molecular Biology
- Chemistry
- Computer Science
- Earth and Planetary Science
- Engineering
- Environmental Sciences
- Mathematical Sciences
- Medicine & Health Sciences
- Physics & Astronomy
- Plant Sciences

Senior Division Categories:

- Animal Sciences
- Behavioral & Social Sciences
- Biochemistry
- Cellular & Molecular Biology
- Chemistry
- Computer Science
- Earth and Planetary Science
- Engineering
- Engineering: Materials & Bioengineering
- Environmental Management
- Environmental Sciences
- Mathematical Sciences
- Medicine & Health Sciences
- Microbiology
- Physics & Astronomy
- Plant Sciences

Student Projects & Display Regulations

1. In compliance with ISEF regulations, the student's project display summarizes the research project and must focus on the student's work for this year's study with only minimal reference to previous research. Longitudinal studies may present only conclusionary data from prior years. (Note: Continuation projects will require a Continuation Project Form to be displayed with the project at the state level.)

2. Only one trifold display board is permitted. Project boards may not be layered.

3. The project display must be limited to the work conducted by the student(s) for the project. Very minimal reference to work done by a mentor or others may be included only for background information or clarification of what the student's research covered and must clearly indicate that it was not part of the student's work.

4. The only items that may be displayed with the project on the tables provided are:

   a. Student's official abstract
   b. Student's research logbook

5. Maximum size of project:

   a. Depth (front to back): 30 inches or 76 centimeters
   b. Width (side to side): 48 inches or 122 centimeters
   c. Height (top to bottom): 72 inches or 183 centimeters

6. Forms required at the project, but not displayed include:
   a. Student Checklist
   b. Research Plan and SRC Approval Form
   c. A photograph/video release form signed by the subject (or legal guardian if the subject is under 18 years of age) is required for visual images of humans (other than the student finalist) displayed as part of the project.

7. Photographs, visual images, charts, tables, and graphs require credits.